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Portfolio strategies using EVA, earnings ratio or book-to-market
Is one best?

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Abstract

Purpose – Past studies have shown that investment strategy using two popular metrics, the earnings-price ratio (EP) and book-to-market ratio (BM) enable investors to reap abnormal returns. More recent development of another ratio, economic value-added-to-market value (EVAM) can be seen as a hybrid of EP and BM ratios. The purpose of this study is to examine whether portfolios created by utilizing the EVAM ratio will generate higher returns than portfolios formed with EP or BM ratios.

Design/methodology/approach – Utilizing the EVA data obtained from Stern Stewart & Co. and financial data from COMPUSTAT and center for research in security prices (CRSP), portfolios are created following the Fama and French portfolio formation methodology. The authors form separate portfolios using EP, BM or EVAM ratios where firms are ranked by a ratio in year t, then split into deciles. Then portfolios are constructed in year $t+1$ for each decile and equally weighted portfolio returns are calculated. The cumulative ten-year returns are compared between portfolios formed with EP, BM and EVAM ratios.

Findings – There are three interesting findings. One, the EP portfolios depict results that have long been documented. That is, value stock (low price-to-earnings ratio firms) and growth stocks (high price-to-earnings ratio) exhibit the highest returns. Two, the ten BM portfolio performances are not statistically different. Three, the EVAM ratios indicate that the negative EVAM (lowest decile) portfolio exhibit the highest return and the second highest return is generated by the highest EVAM portfolio. The general results of the thirty portfolios show that the highest EVAM ratio (EVAM10) performs the best. However, the pairwise mean differences between EP, BM and EVAM portfolios do not show statistical differences over the 1995–2004 period.

Originality/value – Although investment strategies using EP ratio and BM ratio have been thoroughly studied, investment strategy using EVAM ratio has not. Given that it has been documented that EVA is a better conceptual measure of value, portfolio managers or investors would be interested to know whether utilizing EVA for investment strategy would earn a higher return than strategies that use EP or BM ratios.

Keywords Price earning ratio, Benefit-cost ratio, Inverstment appraisal, Value added

Paper type Research paper

1. Introduction

Investment strategies using earnings-price ratio (EP), often referred to as price-earnings ratio and book-to-market ratio (BM) have long been documented as two approaches that generate significant abnormal returns. Basu (1977) was one of the first to document the significant performance of stocks based on EP. In another study, Banz (1981) examined the size effect of stocks and found that size helped produce abnormal returns. Thereafter, Cook and Rozeff (1984), Fama and French (1992, 1995) among others have re-examined the two effects – EP and size. Cook and Rozeff found that there are, indeed, two effects and one did not subsume the other. Meanwhile, Fama and French found that their three-factor model enabled them to capture the effects of EP,

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size and BM. More recently, Yook and McCabe (2001) created portfolios using market value-added per share (MVA) defined as the total market value of the firm minus invested capital divided by total shares outstanding. and found that low MVA per share led to higher average portfolio returns.

Although these ratios appear to capture different components of stock valuation that results in higher portfolio performance, the use of residual income or economic value-added (EVA) has been largely ignored. Stern Stewart & Company's EVA metric has gained popularity given that it is conceptually more closely tied to value[1]. A recent study by Zaima (2008) showed that portfolio strategy utilizing EVA-to-market value ratio (EVAM) exhibited significantly higher returns as compared to the S&P500 Index return over a ten-year period. Moreover, the study found that the performance of the most negative EVA firms exhibits the highest portfolio return. However, after adjusting for risk, it showed that the highest positive EVA firms generated the highest risk-to-return ratio. This study expands past studies by comparing the performance of investment portfolios constructed with EP, BM and EVAM ratios.

The empirical results will be useful for portfolio managers and individual investors for long-term investment purpose. First, this study examines three different portfolios using three ratios stratified over a ten year period allowing investors to examine the long term effect of the strategies. By contrasting the portfolios formed by the different ratios, it enables the investors to obtain many implications. It allows them to see whether low EP or high EP stock investment exhibits a higher return over a longer investment horizon. Second, although past studies document an anomaly based on each of the three ratios, a comparison study determining which ratio provides the best performance has never been conducted.

The following section describes the data and methodology while section 3 presents the empirical results. Finally, section 4 provides a conclusion for the study.

2. Data and methodology

The Stern Stewart & Company 2004 database is utilized in this study. Using the Stern Stewart's EVA calculation, an EVAM ratio is calculated as follows:

$$\mathrm{EVAM}(t) = \frac{\mathrm{EVA}(t)}{(\mathrm{MP}(t) \times \mathrm{NS}(t))} \tag{1}$$

where EVA(t) is EVA as calculated by Stern Stewart & Company for year t as [net operating profits – (WACC×capital)]; WACC is the weighted average cost of capital; MP(t) is the closing market stock price for the last trading day in December for year t; and NS(t) is the number of common stock shares outstanding in December for year t, both obtained from COMPUSTAT.

Additional variables are obtained from the COMPUTAT database: earnings per share, total assets, total debt, December calendar year-end stock price per share and the number of equity shares outstanding at (calendar) year-end. These data are utilized to calculate the following ratios for each firm j.

$$\mathrm{EP}(t) = \frac{\mathrm{EPS}(t)}{\mathrm{MP}(t)} \tag{2}$$

$$\mathrm{BM}(t) = \frac{[\mathrm{TA}(t) - \mathrm{TD}(t)]}{[\mathrm{MP}(t) \times \mathrm{NS}(t)]} \tag{3}$$

where EPS(t) is the net after-tax (undiluted) earnings per share for year t; TA(t) is the total assets for firm j in year t; TD(t) is the total debt for firm j in year t; Abate *et al.* (2004) and Brealey and Myers (2003), among others have shown that BM is directly related to EVA as follows.

$$\left(\frac{\mathrm{MV}}{\mathrm{C}}\right) = 1 + \left[\frac{(\mathrm{EVA}/\mathrm{WACC})}{\mathrm{C}}\right] \tag{4}$$

where MV is the total equity of the firm or MP(t) $\times$ NS(t) and C is capital invested which should equal the firm's book value.

Defining MV/C as market-to-book ratio, the relationship between the BM (or the reversed ratio) and EVA will continue to hold. Hence, a strong conceptual relationship between EVAM and BM ratio should exist. Similarly, the net earnings after taxes used in the calculation of EP ratio are conceptually related to net operating profits after taxes used to calculate EVA. Therefore, the relationship between EP, BM and EVAM ratios are conceptually robust. Proponents of EVA argue that EVA is a more direct measure of value as compared to earnings or book value. They suggest that a ratio using EVA will capture a higher return as compared to EP or BM. An empirical examination of investment strategies using the three ratios will provide evidence as to which ratio performs the best.

All ratios use market value of equity in the denominator to avoid zero earnings per share in the denominator. As in past studies by Basu and Fama and French, negative earnings are deleted from the sample that is used to form portfolios via EP ratios. Similarly, negative book value firms are deleted from the sample used to construct portfolios formed with BM ratios. Finally, to follow the methodology utilized by past studies, financial stocks are excluded from the sample.

By merging firms with data in COMPUSTAT and center for research in security prices (CRSP) the sample reduces to 931 firms. The sample size decreases further due to missing values for EVA and it ranges from 689 to 908 for the study. Since the Stern Stewart & Co.'s database starts with the top1000 MVA firms in the most current year (2004 for this study), a survivorship bias most likely exist. This bias is evidenced by the shrinking sample size from 1,000 to 634, depending on the ratios applied. The sample size diminishes further when negative earnings for the EP portfolio are deleted and BM portfolios reduce because of negative book values. Moreover, the portfolios generated from negative EVA firms also decrease likely due to survivorship bias from 2003 to 1994. The number of firms that are eliminated due to negative earnings is reported in Table I. It shows that 55 firms are eliminated due to negative earnings in 1994 and it increases over the years from 72 in 1995 to 178 in 2000, a recessionary year. After the peak in 2000, 164 are deleted in 2002 and 126 in 2003.

The BM portfolios are formed by removing firms with negative book values. Generally, only two are removed in years 1994 to 1997; however, it increases to nine firms deleted in 2000. The other years reveal a decrease of 6, 7 and 8 firms from the sample in 2001, 2002 and 2003, respectively.

The study utilizes the portfolio formation methodology applied by Fama and French (1992, 1995). Each year, starting from 1994, the ratio is calculated for all firms in the sample and rank ordered from lowest to highest (or negative to positive for EVA(t)/MP(t) only). The firms are split into deciles and ten portfolios are formed each year. Next, stock returns are extracted from CRSP, and average (equally weighted) portfolio holding period return is calculated for each decile using the stock returns for the next year ($t + 1$). Each year ten portfolios are formed where EP1, BM1 or EVAM1 is comprised of the

lowest (negative EVA firms using EVAM ratios) and EP10, BM10 or EVAM10 is the portfolio comprised of firms with the highest ratio. This process is repeated each year and holding period returns are calculated for each of the ten portfolios (deciles) over the 1995 to 2004 period. Portfolios are defined as EP1 to EP10, BM1 to BM10 and EV1 to EV10, for portfolios constructed using ratios EP, BM and EVAM, respectively[2].

Table I displays the EP ratios for each year from 1994 to 2003, providing sample size, EP ratio average as well as its minimum and maximum EP ratios. Since many firms were dropped due to negative earnings, the sample size reduces to 793 (in 2000) to 634 (in 1994). The EP ratio averages between 0.0475 (in 1997) and 0.667 (in 1994). The high average of the EP ratio in 1994 may express the survivorship bias mentioned earlier – only the strongest survive. As for the minimum or the smallest EP ratio for each year, it appears to be relatively consistent at 0.0001 to 0.0007 where the highest exist in 1994. The maximum varies much more in comparison to the minimum. The highest maximum EP ratio occurs in 2003 at 0.8738 and the lowest is in 1997 at 0.1781.

Table II presents the BM ratio data. The sample size remains relative large compared with the EP ratio data where it ranges between 687 (in 1994) and 901 (in 2001

Year	Sample size	EP ratio Average	Minimum	Maximum	Negative earnings per share
1994	634	0.0667	0.0007	0.2699	55
1995	648	0.0612	0.0011	0.2377	72
1996	689	0.0556	0.0003	0.2279	73
1997	705	0.0475	0.0002	0.1781	90
1998	722	0.0497	0.0002	0.1968	102
1999	759	0.0587	0.0002	0.3517	100
2000	793	0.0609	0.0001	0.4598	96
2001	729	0.0523	0.0003	0.7742	178
2002	744	0.0595	0.0005	0.5000	164
2003	766	0.0546	0.0006	0.8738	126

Note: The ratios are lagged by one year for each portfolio where 1994 ratio is used to form the portfolios in 1995. Therefore the ratios are calculated over the 1994 to 2003 period

Table I.
Descriptive statistics for EP ratio from 1994 to 2003*

Year	Sample size	BM ratio Average	Minimum	Maximum	Negative book value
1994	687	1.8264	0.0928	23.1794	2
1995	718	1.4372	0.0507	16.2279	2
1996	760	1.2532	0.0590	13.3973	2
1997	793	1.0156	0.0389	12.8164	2
1998	818	1.1003	0.0095	17.0006	5
1999	848	1.3049	0.0098	25.7534	9
2000	881	1.4023	0.0131	38.6352	5
2001	901	1.4290	0.0017	26.7259	6
2002	901	1.7499	0.0318	21.6966	7
2003	884	1.3567	0.0110	21.7882	8

Note: The ratios are lagged by one year for each portfolio where 1994 ratio is used to form the portfolios in 1995. Therefore the ratios are calculated over the 1994 to 2003 period

Table II.
Descriptive statistics for BM ratio from 1994 to 2003*

and 2002). The BM ratio averages are relatively similar over the years; it ranges between 1.0156 (in 1997) and 1.8264 (in 1994), where the high BM ratio in 1994 may be attributed to survivorship. The minimum BM ratios are relatively variable, ranging from 0.0017 (in 2001) to 0.928 (in 1994). Finally, the maximum BM ratio ranges between 12.8164 (in 1997) and 38.6352 (in 2000) where the high BM ratio in 2000 may reflect the demise of the technology boom.

Table III reports the EVAM ratio. The sample sizes are relatively high given that it is based on data produced by Stern Stewart & Co., the creator of EVA data. It ranges between 689 (in 1994) and 908 (in 2002). The average EVAM ratio interestingly exhibits large variability. The highest average EVAM ratio occurs in 1995 (+0.0033), whereas the lowest occurs in 1994 (−0.0148). The minimum EVAM ratios are also variable with the lowest one being −6.7192 (in 2002) and the highest minimum equals −0.4968 (in 1997). The maximum EVAM ratio ranges between 8.8214 (in 2000) and 0.1276 (in 1998). It is possible that the 2000 crash in the technology sector may have contributed to the spread in EVAMs which ranges between −6.5342 and +8.8214. The number of positive EVAM ratio as compared to negative EVAM ratio is presented in the last column of Table III. Examining the frequency of positive and negative EVAM ratios provide an interesting picture. In 1994, the number of EVAM ratios is much great than negative EVAM ratios, whereas the number of positive EVAM ratios in 2001 to 2003 are almost equal. Again, it displays the existence of survivorship bias.

The next section provides empirical results for the investment strategies created with the three ratios – EP, BM and EVAM.

3. Empirical results

First, the portfolio performance for stocks formed by each ratio is presented, then a pairwise comparison of the performance between portfolios formed by the three ratios are statistically examined. The test statistics used are the T test and the Wilcoxon non-parametric test examining the portfolio mean difference between EP and BM, EP and EVAM and BM and EVAM.

The portfolios ranked by EP ratios are presented in Table II where the ten portfolios ranked from lowest to highest ratio portfolios. Portfolio EP1 is comprised of firms with the lowest EP ratios or alternatively, the highest price-earnings ratio while EP5 is the

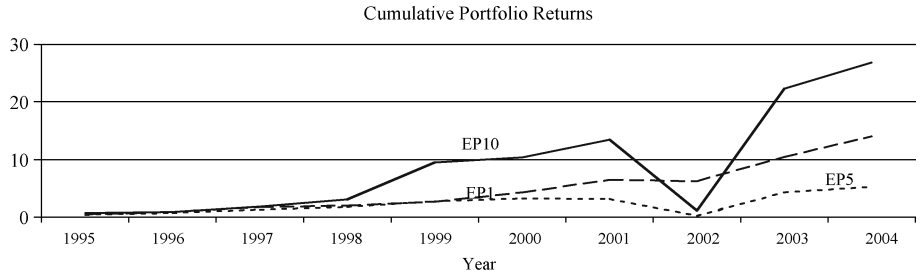
Year	Sample size	EVAM ratio Average	Minimum	Maximum	Positive/negative
1994	689	−0.0148	−1.8444	0.3219	331/358
1995	720	+0.0033	−0.8020	0.2419	487/233
1996	762	+0.0004	−0.5693	0.1857	514/248
1997	795	−0.0036	−0.4968	0.1345	511/284
1998	823	−0.0148	−6.5342	0.1276	549/274
1999	857	−0.0017	−1.1435	0.2781	527/330
2000	886	−0.0087	−6.5342	8.8214	536/350
2001	907	−0.0276	−2.9226	0.4240	468/439
2002	908	−0.0821	−6.7192	0.4675	443/465
2003	892	−0.0265	−1.8026	0.1674	489/403

Table III.
Descriptive statistics for EVAM ratio from 1994 to 2003*

Note: The ratios are lagged by one year for each portfolio where 1994 ratio is used to form the portfolios in 1995. Therefore the ratios are calculated over the 1994 to 2003 period

mid-level EP ratio firms, and EP10 depicts the highest EP ratio firms or alternatively, the lowest price-earnings ratio firms. The EP1 portfolio cumulative return outperforms the other two portfolios over the 1995 to 2004 period. However, EP10 appears to be second best. The results imply that the value investing (low P/E) and growth investing (high P/E) are, indeed, worthwhile investment strategies. Portfolio EP1 (high P/E ratio stocks) exhibits a 2,684.65 per cent return over the 1995 to 2004 period, whereas the EP10 portfolio (low P/E ratio stocks) reports a 1,401.08 per cent return over the same investment horizon. The other portfolios, EP2 to EP9 are much lower in returns ranging from 468.01 per cent (for EP7) to 763.57 per cent (for EP4). The results support the well-known strategy that either value investing with low P/E ratio or growth investing with high P/E ratio outperforms the others. Figure 1 displays the cumulative returns for EP1, EP5 and EP10 and supports the same results.

Table IV also presents performance for portfolios formed using the BM. The results do not display the same exaggerated effect as the EP portfolios. The lowest BM ratio portfolio (BM1) has a relatively higher return of 1,193.12 per cent, whereas the highest BM ratio portfolio, BM10, generates the highest portfolio return (1,358.26 per cent). In contrast to the EP strategy, the BM strategy is not bi-modal indicating strong performance in the two extreme portfolios only (EP1 and EP10). Instead, BM9 earns a relatively high return also (1,099.59 per cent) and the others fall between 460.91 per cent (for BM6) and 749.71 per cent (for BM8). Figure 2 depicts a graphical presentation



Notes: EP1 represents the lowest EP ratio portfolio (or highest price-earnings ratio portfolio); EP5 is the middle of the ten portfolios formed with EP ratios; and EP10 is the highest EP ratio portfolio (or the lowest price-earnings ratio portfolio)

Figure 1.
Portfolio cumulative ten-year returns for EP1, EP5 and EP10 from 1995 to 2004

Portfolio	Ten-year cumulative returns (%)	Portfolio	Ten-year cumulative returns (%)	Portfolio	Ten-year cumulative returns (%)
EP1	2,684.65	BM1	1,193.12	EVAM1	3,369.51
EP2	539.65	BM2	704.60	EVAM2	664.88
EP3	472.83	BM3	538.05	EVAM3	705.66
EP4	763.57	BM4	534.83	EVAM4	561.25
EP5	527.01	BM5	732.67	EVAM5	608.93
EP6	489.40	BM6	460.91	EVAM6	564.42
EP7	468.01	BM7	640.03	EVAM7	386.80
EP8	733.55	BM8	749.71	EVAM8	522.78
EP9	659.46	BM9	1,099.59	EVAM9	533.17
EP10	1,401.08	BM10	1,358.26	EVAM10	1505.52

Table IV.
Portfolio cumulative ten-year returns formed by EP, BM and EVAM ratios 1995 to 2004

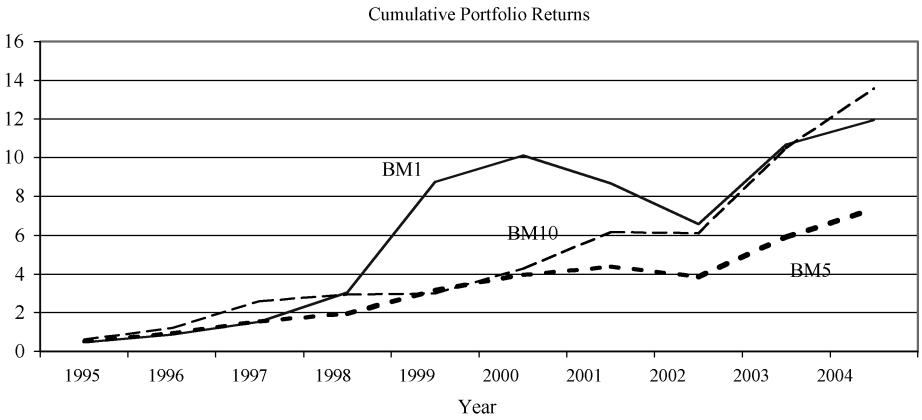


Figure 2.
Portfolio cumulative ten-year returns for BM1, BM5 and BM10 from 1995 to 2004

Notes: BM1 represents the firms with the lowest BM ratio (equivalently the highest market-to-book ratio); BM5 is the firms with the mid-level BM ratios; and BM10 represents the firms with the highest BM ratio (alternatively, the lowest market-to-book ratio)

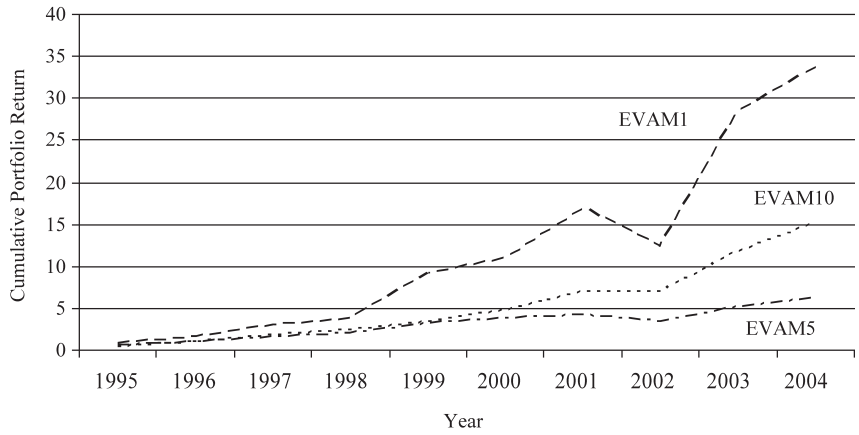
of the BM portfolios and shows that although there is more volatility in BM1, the ten-year cumulative returns for BM1 and BM10 are very close.

Finally, Table IV presents the portfolios formed with EVAM. The results are similar to the EP portfolios indicating that the extreme portfolios earn the highest returns (EVAM1 and EVAM10). Portfolio EVAM1 generates an incredible 3,369.51 per cent, whereas EVAM10 earns a 1,505.52 per cent. In contrast, the other portfolios, EVAM2 to EVAM9, fall within the range of 386.80 per cent (for EVAM7) to 705.66 per cent (for EVAM3). Note that the EVAM portfolios are formed with the inclusion of negative EVA firms, which may have been deleted in the EP ratio portfolios due to negative earnings. Therefore, the EVAM ratio is more versatile than the EP ratio because it allows for inclusion of firms with negative EVAs. The negative EVA firms may indeed be the ones with high volatility but high returns to compensate for the inherent risk of startups or new ventures. Figure 3 illustrates the volatile returns over the ten-year cumulative return for EVAM1, whereas EVAM10 and EVAM5 are more stable.

To provide a more complete comparison between the portfolio performances of the three ratios, Table V displays the geometric average annual returns and the Sharpe measures for the portfolios, EP1 to EP10, EM1 to BM10 and EVAM1 to EVAM10. For the EP portfolios, EP1 shows the highest cumulative return over ten years, but its Sharpe measure is relatively low (0.684), whereas EP10 exhibits the highest Sharpe measure (1.551). Moreover, all portfolios, except for EP2, outperforms EP1 implying that EP1 or growth stocks tend to be relatively riskier and the average annual return (though high) does not compensate for the risk.

Table V also reports the geometric average annual returns and Sharpe measures for the BM portfolios. In this case, the results are not quite as dramatic. That is, BM8 presents the highest Sharpe measure (1.327) followed by BM5 with a Sharpe measure of 1.235. The highest BM ratio portfolio, BM10, earns the third highest Sharpe measure at 1.218. Again, despite the high cumulative return for BM1, it did not demonstrate a strong performance measure where its Sharpe measure is 0.609.

Finally, Table V presents the geometric average annual returns and Sharpe measures for EVAM portfolios. Similar to the other two ratios, EVAM1, despite its



Notes: EVAM1 represents the lowest EVAM ratio portfolio (or the portfolio with the largest negative EVA firms); EVAM5 is the middle of the ten portfolios formed with EVAM ratios; and EVAM10 is the highest EVAM ratio portfolio (or the portfolio with the highest EVA firms)

Figure 3.
Portfolio cumulative returns for EVAM1, EVAM5 and EVAM10 from 1995 to 2004

Portfolio	Geometric average return	Sharpe measure	Portfolio	Geometric average return	Sharpe measure	Portfolio	Geometric average return	Sharpe measure
EP1	0.3947	0.684	BM1	0.2917	0.609	EVAM1	0.4257	0.897
EP2	0.2039	0.644	BM2	0.2318	0.991	EVAM2	0.2256	0.938
EP3	0.1907	0.918	BM3	0.2036	0.991	EVAM3	0.2320	1.030
EP4	0.2406	1.200	BM4	0.2030	1.209	EVAM4	0.2079	0.824
EP5	0.2015	1.152	BM5	0.2361	1.235	EVAM5	0.2164	1.009
EP6	0.1941	1.265	BM6	0.1882	1.141	EVAM6	0.2085	1.160
EP7	0.1897	1.189	BM7	0.2216	1.001	EVAM7	0.1715	1.021
EP8	0.2362	1.198	BM8	0.2386	1.327	EVAM8	0.2007	1.195
EP9	0.2248	1.241	BM9	0.2820	1.139	EVAM9	0.2027	1.202
EP10	0.3111	1.551	BM10	0.3073	1.218	EVAM10	0.3200	1.995
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Table V.
Portfolio geometric average annual return, SD and sharpe measure

incredibly high cumulative and average return, presents lackluster performance. Much like the EP portfolios, the best portfolio is exhibited by the highest ratio portfolio – EVAM10. However, the rest of the pattern is slightly different from EP and BM portfolios. The Sharpe measures for the EVAM portfolios, generally, support a linear progression. That is, EVAM10 has the highest performance measure followed by EVAM9, then by EVAM8. Thereafter, EVAM7, EVAM6, EVAM5 and EVAM3 report similar numbers, whereas EVAM4, EVAM2 and EVAM1 yield Sharpe measures below 1.0. Of the thirty portfolios formed between EP1 to EP10 BM1 to BM10 and EVAM1 to EVAM10, the highest Sharpe measure (1.995) is generated by EVAM10. The results indicate that EVA10 or the highest EVA firms performs the best.

Our final analysis conducts a statistical test of the difference between performances of EP and BM portfolios, EP and EVAM portfolios as well as the difference between BM and EVAM portfolios. Table VI presents the results of the *t* statistics of the

Table VI.
Statistical tests of portfolio performance differences between EP vs BM, EP vs EVAM and BM vs EVAM

	Mean annual return			BM vs EP (p-value)[a]		BM vs EVAM (p-value)		EP vs EVAM (p-value)	
	BM	EP	EVAM	t-test	Wilcoxon	t-test	Wilcoxon	t-test	Wilcoxon
P1	0.3540	0.4829	0.4918	0.56	0.82	0.51	0.52	0.97	0.91
P2	0.2499	0.2386	0.2455	0.92	0.91	0.96	0.99	0.95	0.97
P3	0.2179	0.2055	0.2492	0.89	0.73	0.73	0.73	0.64	0.57
P4	0.2126	0.2543	0.2284	0.60	0.47	0.86	0.97	0.79	0.68
P5	0.2486	0.2119	0.2320	0.64	0.73	0.85	0.85	0.81	0.79
P6	0.1970	0.2019	0.2195	0.94	0.79	0.76	0.57	0.80	0.91
P7	0.2378	0.1981	0.1810	0.63	0.68	0.5	0.43	0.80	0.73
P8	0.2498	0.2489	0.2099	0.99	0.99	0.59	0.38	0.62	0.62
P9	0.3021	0.2357	0.2121	0.48	0.57	0.33	0.31	0.75	0.68
P10	0.3275	0.3244	0.3283	0.98	0.97	0.99	0.85	0.96	0.91

Notes: [a]The data under t-test and Wilcoxon reports the probability that the null hypothesis cannot be rejected; the null hypothesis states that the average portfolio returns are equal

differences of the portfolio (arithmetic) average returns as well as a Wilcoxon non-parametric test with the null hypothesis that the two portfolio returns are equal. The results of the comparative statistics show that we cannot reject the hypothesis that the difference in performance of the ten portfolios formed by EP and BM are equal. The null hypothesis that the two average portfolio returns are the same is supported with a probability reported below the column labeled t-test and Wilcoxon. The probability is as high as 99 per cent for portfolio 8 (that compares the difference of the mean between EP and BM) to 48 per cent. The Wilcoxon non-parametric test provides similar results and we cannot reject the null hypothesis that the mean portfolio differences are equal. Similar results are reported for the mean portfolio differences between BM and EVAM portfolios. Again, testing the null hypothesis that the mean differences between BM and EVAM portfolios are the same cannot be rejected using the t statistics as well as the Wilcoxon test. Finally, testing the null hypothesis whether the mean differences between EP and EVAM portfolios are the same cannot be reject. Unfortunately, the large SD between portfolios appear to reduce the power of the test and drive the test results. These results also attest to what we found in Table V. That is, the same pairwise portfolios (EP10, BM10 and EVAM10) appear to earn relatively similar returns and consequently unable to reject the hypothesis that the portfolio means are the same.

4. Conclusion

The investment strategies using three ratios, EP, BM and EVAM present some interesting results. The cumulative portfolio returns over the ten-year period from 1995 to 2004 reveal that the EP portfolios support documented evidence that the lowest EP portfolio (or growth stocks) and the highest EP portfolio (or value stocks) earn the highest returns or 2,684.65 per cent and 1,401.08 per cent, respectively. The results for the BM portfolios also support past studies. BM10 earns the highest return where it represents the lowest market-to-book ratio displaying the largest deviation between book value and market value. Finally, EVAM portfolio results appear to emulate the EP portfolios. However, an interesting contrast is that the lowest EVAM portfolio is comprised of negative EVA firms. Despite the fact that EVAM1 represent negative EVA firms, its portfolio return is the highest (3,369.51 per cent). The second best

performing EVAM portfolio represents the firms with the largest EVAs. That is, the EVA represents the highest proportion of the firms' market value in comparison to the other portfolios.

However, when the study examines the geometric average annual returns and its Sharpe measures, the results show that the best of the ten portfolios is EP10, BM8, and EVAM10, respectively. Moreover, the highest average annual returns, EP1 and EVAM1, results in the lowest Sharpe measures indicating that the risk outweigh the high returns generated by the portfolios. Finally, examining the pairwise portfolio returns between EP and BM, EP and EVAM and BM and EVAM show that there are no statistical differences between them. These results imply that investing strategies using EP or BM are just as effective as a strategy using EVA even if EVA conceptually relates more closely to value. However, when comparing all the portfolios individually using the Sharpe measure, EVAM10 performs the best out of the 30 portfolios.

Notes

1. EVA™ is a trademark registered by Stern Stewart & Company. They define EVA as NOPAT – k*Capital +/– Adjustments where NOPAT is net operating profits after taxes, *k* is weighted average cost of capital, and adjustments include various changes to the accounting data to conform to economic cash flows. Additionally, MVA is defined as Market value of a Firm minus total capital where market value of a firm equals the market value of equity and debt and total capital equals total capital invested in the firm.
2. Note the EP1 can also be defined as the highest price-earnings ratio or growth stocks and EP10 is the same as the lowest price-earnings ratio or value stocks.

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